

Application No.: 10/820,024
Amendment under 37 CFR 1.111
Reply to Office Action dated May 12, 2006
August 14, 2006

REMARKS

By this amendment, claims 1-2, 4 and 8 have been cancelled, claims 3, 5-7 and 9-10 have been amended and new claims 11-34 have been added in the application. Currently, claims 3, 5-7, 9-34 are pending in the application.

Applicants reserve the right to file a divisional application on the non-elected invention.

Claims 3 and 7-10 were rejected under 35 USC 103(a) as being obvious over Weber et al. Also, claims 4-6 were rejected under 35 USC 103(a) as being obvious over Weber et al. in view of Henry et al. (U.S. Patent No. 6,156,390).

Applicants note that claims 8 and 9 were rejected under 35 USC 103(a) as being obvious over Weber et al. However, since dependent claims 8-9 respectively depend from dependent claims 4-5, applicants believe that the Examiner meant to reject claims 8-9 under 35 USC 103(a) as being obvious over Weber et al. in view of Henry et al. Accordingly, applicants have responded to this office action using this assumption.

These rejections are respectfully traversed in view of the amendments to the claims and the remarks below.

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The present invention relates to a conductive electroless plated powder and a method for making the same. More particularly, the present invention relates to a conductive electroless plated powder provided with nickel films having improved heat resistance (see page 1, lines 7-11 of the specification).

In the nickel film of the plated powder of the present invention, many columnar structures extending in the direction of the thickness gather tightly to form a dense, homogeneous, and continuous film as shown in Fig. 1. On the other hand, in the nickel film of the conventional plated powder shown in Fig. 2, crystal grains are rough and heterogeneous. The present inventors have found that, in the nickel film having the columnar structures as shown in Fig. 1, heat resistance is high, and the conductivity of the plated powder is not easily decreased even under high temperature conditions (see page 5, lines 9-19 of the specification).

The present invention discloses that it is important to involve a complexing agent in the initial thin film-forming solution. By incorporating the complexing agent in the initial thin film-forming solution and by incorporating the complexing agent in the nickel ion-containing solution, it is possible to easily form a nickel film having columnar structures. From this

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viewpoint and from the viewpoint of the solubility of the complexing agent, the amount of the complexing agent in the initial thin film-forming solution is preferably 0.003 to 10 moles/l and more preferably 0.006 to 4 moles/l (see page 12, line 20 - page 13, line 14 of the specification).

The aqueous suspension prepared by mixing the aqueous suspension containing the core particles and the initial thin film-forming solution is subjected to an electroless plating step. In the aqueous suspension before being subjected to the electroless plating step, the ratio of the sum of the surface areas of the core particles contained in the aqueous suspension to the volume of the aqueous suspension, which is generally referred to as a load, is preferably 0.1 to 15 m²/l and more preferably 1 to 10 m²/l in view of the fact that it is possible to easily form the nickel film having columnar structures. If the load is too heavy in the electroless plating step, nickel ions are extremely reduced in the liquid phase, and a large amount of fine nickel particles is generated in the liquid phase and attached to the surfaces of the core particles, resulting in a difficulty in forming uniform nickel films (see page 13, line 19 - page 14, line 7 of the specification).

By this amendment, independent claim 3 has been amended to recite the steps of "adjusting the amounts of the nickel ion-

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containing solution added and the reducing agent-containing solution added; adjusting the initial concentration of the complexing agent in the aqueous suspension; and adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in said step of (III) adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution".

These features are not shown or suggested by Weber et al., Henry et al. or any combination of these references.

Weber et al. relate to a substrate, a method of nucleation, a powder, and a method for metal plating (see column 1, lines 6-7). Glass substrates in the form of plates of glass or glass powder are nucleated with palladium and then coated with a layer of nickel/tungsten (see column 3, lines 49-52).

Weber et al. also disclose that to apply a layer of nickel/tungsten alloy to the nucleated glass powder, the powder is exposed to an aqueous solution containing a tungsten salt, preferably a tungstate, a nickel salt, preferably nickel sulfate, and a reducing agent such as a dialkylaminoborane and optionally other additives such as a wetting agent (see column 4, line 40-45).

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Weber et al. do not disclose adjusting the amounts of the nickel ion-containing solution and the reducing agent-containing solution; adjusting the initial concentration of the complexing agent in the aqueous suspension; and adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in the step of (III) adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution as claimed in independent claim 3.

For these reasons, it is believed that Weber et al. do not show or suggest the present claimed features of the present invention. Applicants also submit that Henry et al. do not make up for the deficiencies in Weber et al.

Henry et al. relate to metal plating and more particularly to the co-deposition of fluorinate carbon and a diamond-containing material with electroless metal platings (see column 1, lines 5-7).

Henry et al. disclose that it is preferred that the electroless nickel bath be formulated separately with the reducing agent and the complexing agent. To the electroless metal bath is then added the suspension of the fluorinated carbon and the diamond-containing material in the appropriate

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proportions. The amount of the reducing agent is not critical and can likewise be varied within wide ranges. Typically, the reducing agent may be present in amounts ranging from 20 to 200 grams per liter. (see column 5, lines 16-24).

Henry et al. do not disclose adjusting the amounts of the nickel ion-containing solution and the reducing agent-containing solution; adjusting the initial concentration of the complexing agent in the aqueous suspension; and adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in the step of (III) adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution as claimed in independent claim 3.

It is therefore respectfully submitted that Weber et al., Henry et al., individually or in combination, do not teach, disclose or suggest the presently claimed invention and it would not have been obvious to one of ordinary skill in the art to combine these references to render the present claims obvious.

Claims 3-10 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being obvious over claims 3-15 of copending Application No. 10/820,025 (U.S.

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Patent Application Publication No. 2005/0227074) in view of Henry et al.

Applicants hereby submit a Terminal Disclaimer to obviate the double patenting rejection over this application. Applicants respectfully submit that claims 3-10 should be allowed in view of the Terminal Disclaimer, the claim amendments to independent claim 3 submitted herewith and the remarks presented above.

New dependent claim 11, which depends from dependent claim 10, has been added in the application. New dependent claim 11 has been added to recite "said step of imparting the noble metal ion-capturing ability to the core particles by a surface treatment includes adjusting the amount of the surface treatment in the range between 0.3 and 100 mg/m² of the surface area of the core particles". Applicants respectfully submit that Weber et al., Henry et al. or any combination of these references do not disclose, show or suggest adjusting the amount of the surface treatment in the range between 0.3 and 100 mg/m² of the surface area of the core particles. Allowance of this claim is also respectfully requested.

Also, new dependent claims 12-15, which directly or indirectly depend from independent claim 3, have been added in the application. Applicants respectfully submit that new dependent claims 12-15 are respectively similar to dependent

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claims 5-7 and 9 and include the name of the specific step so that it is clear in which step the recited chemical is used. Also, applicants respectfully submit that these dependent claims define over the prior art of record. Allowance of these claims is also respectfully requested.

Also, new independent claim 16 has been added in the application. Applicants respectfully submit that new independent claim 16 has been added to recite "a method for making a conductive electroless plating powder including columnar structures extending in a direction of a thickness of a nickel film". New independent claim 16 also recites "providing a ratio of the sum of the surface areas of the core particles contained in the aqueous suspension to the volume of the aqueous suspension between 0.1 to 15 m²/l". In addition, new independent claim 16 recites "adjusting the amounts of the nickel ion-containing solution added and the reducing agent-containing solution added; adjusting the initial concentration of the complexing agent in the aqueous suspension; adjusting the concentration of the complexing agent in the nickel ion-containing solution, so as to maintain the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in said step of adding a nickel ion-containing solution containing the same complexing agent and a reducing agent-containing solution".

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Applicants respectfully submit that these claimed features of new independent claim 16 are different from Weber et al., Henry et al. or any combination of these references because the present invention discloses applying a second solution individually and simultaneously to the first solution, and maintaining the concentration of the complexing agent in the aqueous suspension in the range of 0.003 to 10 moles/l in the step (III), and before the step (III), a ratio of the sum of the surface area of the core particles contained in the aqueous suspension to the volume of the aqueous suspension between 0.1 to 15 m²/l. Therefore, allowance of new independent claim 16 is also respectfully requested.

Also, new dependent claims 17-32, which directly or indirectly depend from new independent claim 16, have been added in the application. Applicants respectfully submit that these claims recite additional features and also define over the prior art of record.

For example, Weber et al. and Henry et al. do not disclose that the step of allowing core particles includes dispersing the core particles in a weakly acidic aqueous solution of a noble metal salt which is palladium chloride so that the noble metal ions are captured by the surfaces of the core particles as claimed in new dependent claim 17. Moreover, Weber et al. and

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Henry et al. do not disclose that the step of dispersing the core particles in an initial thin film-forming solution containing a complexing agent including using glycine for the complexing agent; and the step of adding a nickel ion-containing solution containing the complexing agent including using glycine for the complexing agent as claimed in new dependent claim 25. Allowance of these dependent claims is also respectfully requested.

Also, new independent claim 33 has been added in the application. Applicants respectfully submit that new claim 33 has been added to recite the step of "forming a gold plating layer as a top layer on the nickel film". Applicants respectfully submit that this additional feature of new independent claim 33 also defines over the prior art of record. Therefore, allowance of new independent claim 33 is also respectfully requested.

Also, new independent claim 34 has been added in the application. Applicants respectfully submit that new claim 34 has been added to include the claimed features of new independent claim 16 and to also recite the step of "forming a gold plating layer as a top layer on the nickel film". Applicants respectfully submit that this additional feature of new independent claim 34 also defines over the prior art of record.

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Therefore, allowance of new independent claim 34 is also respectfully requested.

In view of foregoing claim amendments and remarks, it is respectfully submitted that the application is now in condition for allowance and an action to this effect is respectfully requested.

If there are any questions or concerns regarding the amendments or these remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

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